

Impact of ECI on DOE Co-design Strategies

James A. Ang, Ph.D., Manager
Scalable Computer Architectures



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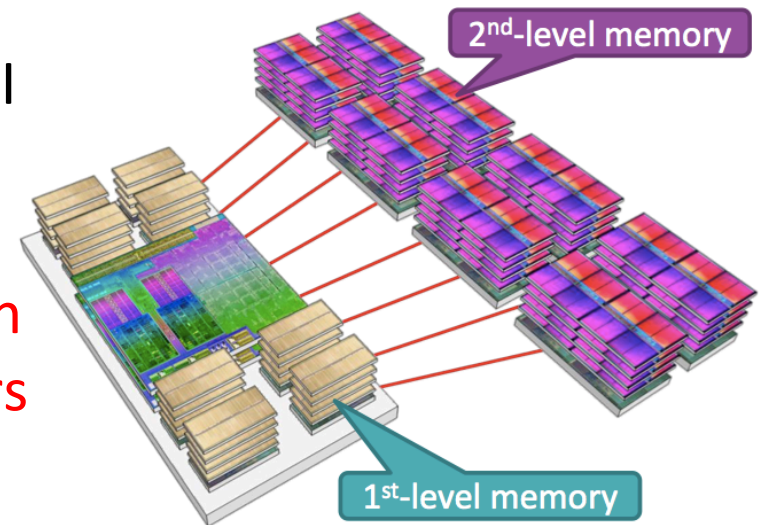
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ECI Provides DOE a Key Opportunity

- Time frame and funding to:
 - Design hardware and system architectures
 - Modernize DOE's legacy applications portfolio
- ECI can support two complementary Co-design strategies
 - *Clean sheet* development of applications/algorithms with largely predetermined Hardware and System Architectures
 - *Clean sheet* development of hardware/system architectures with largely predetermined Applications and Algorithms

Clean Sheet development of Application/Algorithms with *a priori* defined HW/System Architectures

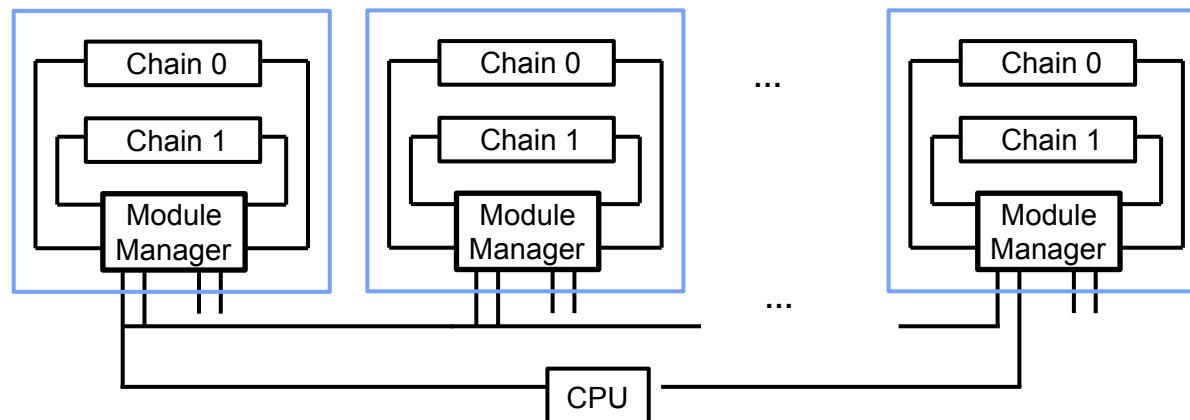
- This maps to an *Application-centric Proactive* Co-design path
- This approach has synergy with DOE/SC applications that are un-encumbered by a large legacy code base
- Note: Even if there were enough ECI budget to scale this strategy to the entire portfolio of DOE Legacy Applications, **we do not have enough application and algorithm developers to rely solely on this strategy**



e.g. AMD Two Level Memory Concept

Clean Sheet development of HW/System Architectures with *a priori* defined Applications/Algorithms

- ECI provides an opportunity to pursue a complementary strategy. This is an *Architecture-centric Proactive* Co-design path with a required “bridge” to DOE’s portfolio of legacy applications.
- This strategy complements *Application-centric* by focusing Computer Industry R&D efforts on designs that reduce DOE application and algorithm developer efforts



e.g. Advanced Concept: *Modules of Chains of HMCs*

Fully Funded ECI is Required to Pursue these Strategies

- These two strategies, while *distinct*
are not necessarily *independent*
- Progress in the strategies can inform each other,
i.e., *Holistic* Co-design
- Both strategies require System Software R&D, but needed
System Software capabilities may differ due to Application
and Architecture differences

Final Thoughts about ECI Impact

- Despite misperceptions,
ECI is not about reaching 10^{18} floating point operations per second
- We should not squander our ECI opportunity
- Prioritization criteria for DOE Exascale Co-design:
 - All Architecture R&D is not equal. Should prioritize efforts that ease the Application/algorithm developer burden.
 - All Application Development is not equal. Should prioritize approaches that can “bridge” to our legacy code base.
 - System Software Investments that support *these priorities* are critical to DOE Exascale Co-design